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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/659,484

09/11/2000

Takeshi Takagi

0819-374

9022

22204

7590

04/17/2003

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EXAMINER

LOUIE, WAI SING

ART UNIT

PAPER NUMBER

2814

DATE MAILED: 04/17/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/659,484

Applicant(s)

TAKAGI ET AL.

Examiner

Wai-Sing Louie

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the corresponding address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 February 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8 and 10 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8 and 10 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 8.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-8 and 10 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

- In claim 1, the disclosed specification or diagrams do not disclose a base layer containing an impurity of a first conductivity type.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-9 and 10 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

- In claim 1, it is unclear which is a base layer containing an impurity of a first conductivity type in fig. 1 and 8.

Art Unit: 2814

- In claim 1, it is unclear what is meant by the "high-concentration doped layer is a barrier layer from the viewpoint of holes in the base layer".

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-6, 8, and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jorke (US 5,798,539) in view of Yamazaki (US 5,440,152).

With regard to claims 1, 8, and 10, Jorke discloses a bipolar transmitter (col. 2, line 66 to col. 4, line 36 and fig. 1a) comprising an emitter layer 4 containing an impurity of a first conductivity type, a base layer 3 containing an impurity of a second conductivity type, and a collector layer 3 containing a impurity of the first conductivity type, the bipolar transmitter having:

- A high-concentration doped layer 5 being provided in the emitter layer and doped with the impurity of the first conductivity type at a higher concentration than in the emitter layer (col. 3, lines 35-44), where a composition of a material composing the emitter layer is the same as that of a material composing the high-concentration doped layer 5 (col. 4, line 36 and col. 4, line 41);

- Jorke discloses a high-concentration doped layer 5, but does not disclose the layer 5 is a barrier layer from the viewpoint of holes in the base layer. However, Jorke's device matches the claimed device having the high-concentration doped layer in the same location. Therefore, the high-concentration doped layer 5 must be a barrier layer from the viewpoint of holes in the base layer;
- Jorke discloses a SiGe base layer 3, but does not disclose the Ge composition ratio is graded though out the layer. However, Yamazaki discloses the base layer 10 is SiGe, where the Ge concentration is graded (Yamazaki col. 6, line 32). Yamazaki teaches crystal defects would be effectively restrained with the graded Ge content in the base layer (Yamazaki col. 1, lines 13-25). Therefore, it would have been obvious at the time the invention was made to modify Jorke's device with the teaching of Yamazaki to provide a graded SiGe base layer in order to restrain the crystal defects. Yamazaki disclose the Ge concentration changes from the collector layer interface toward the emitter layer (Yamazaki col. 7, lines 30-50).

With regard to claims 2-3 and 6, Jorke discloses the base layer 3 containing an impurity of a second conductivity type, the base layer is delta-doped have a thickness only a few nm (col. 3, lines 28-31). Jorke discloses the dopant concentration is 10^{14} cm^{-2} (col. 3, line 21). The doping density within this few nanometers can be calculated to about 10^{20} cm^{-3} , which is much higher than the emitter doping concentration (see col. 3, line 36).

Art Unit: 2814

With regard to claim 4, Jorke discloses the cap layer 5 has higher-concentration doping, which has more than ten times higher than the concentration of the emitter layer 4 (col. 3, lines 35-43).

With regard to claim 5, Jorke, modified by Yamazaki in claim 1 above, would disclose a pn-junction from at the interface of emitter/base junction and a diffusion (depletion) region 13 is formed adjacent to the high-concentration doped base layer (Yamazaki col. 6, lines 37-40).

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jorke (US 5,798,539) modified by Swanson et al. (US 6,362,065) as applied to claim 1 above, and further in view of S. M. Sze in Physics of Semiconductor Device, 2nd Edition, 1981.

With regard to claim 7, Jorke discloses the emitter layer 4 is made of silicon and the base layer 3 is made of SiGe, but does not disclose the emitter layer 4 has wider bandgap than the base layer 3. However, S. M. Sze discloses the bandgap energy of Si is 1.12 eV and Ge is 0.66 eV. Therefore, it would have been obvious that pure Si emitter layer 4 has wider bandgap energy than the SiGe base layer 3.

Response to Arguments

Applicant's arguments filed 2/13/03 have been fully considered but they are not persuasive.

- Applicant's arguments with respect to claims 1-8 and 10 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wai-Sing Louie whose telephone number is (703) 305-0474. The examiner can normally be reached on 7:30 AM to 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (703) 308-4918. The fax phone numbers for the


Art Unit: 2814

organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

WSI

April 9, 2003


LONG PHAM
PRIMARY EXAMINER